

THE RESULTS OF MEDICINAL TREATMENT IN ELEVEN HUNDRED AND SIX CASES OF DELIRIUM TREMENS.

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NOTWITHSTANDING the considerable discussion which the subject has received, the treatment of delirium tremens is very unsatisfactory; and there is little agreement among the various writers as to the best method of procedure. Some advise hypnotics in large doses, others regard them as dangerous in even the smallest quantities, believing that they never shorten the delirium and often unfavorably influence an already weakened heart. Whether whisky should be used is a mooted question, as is also the use of digitalis and other stimulants. Sedative baths are recommended by some and condemned by others. In view of these facts there seems to be sufficient justification for a further study of the subject.

COLLECTION OF THE STATISTICS. Of the 1106 cases on which this paper is based, 934 were under treatment in the Cook County Hospital, Chicago, during the years 1905 to 1910 inclusive. The 172 remaining cases were treated at the Massachusetts General Hospital. It was thought best, for reasons soon to be given, not to include the latter in the detailed analysis to which the Cook County Hospital cases were subjected, and they are considered separately throughout this paper. Five hundred of the Cook County Hospital cases, treated from 1905 to 1908, were made the basis of an earlier report;¹ the remaining 434 were collected at a later date.

In collecting the statistics the original history was examined in each case and the relevant facts transcribed on a library card. Each card was made to show the age and sex of the patient, whether the case was incipient or fully developed, whether it developed from the first to the second stage in the hospital, and if so, after how long and under what treatment, and also to show each drug used, with the size and number of the doses, together with the results of the treatment and the complications. The cards could then be readily sorted and the cases classified according to any one of the points noted. A considerable number of these cases, though by no means the greater part, have been under the observation of one or the other of us. For permission to examine the hospital records, our thanks are due to the authorities in charge of the Cook County Hospital and of the Massachusetts General Hospital.

COURSE OF THE DISEASE. The course of the disease presents two quite sharply defined stages: an incipient stage characterized

¹ Jour. Amer. Med. Assoc., 1909, p. 1221.

by insomnia, restlessness, tremor, and occasionally by hallucinations, which are, however, recognized as such, and later a stage of delirium characterized by uncorrected, chiefly visual hallucinations. The patients in the second stage are usually fearful but may be amused by their visions and are very noisy, with great incoördination. There is usually fever, 100° to 102° F., slight leukocytosis, 7000 to 9000, and profuse perspiration. Since these two phases of the disease are as sharply defined in their reaction to medicinal treatment as they are in their clinical manifestations, and since many of the incipient cases never become delirious, it is of fundamental importance that statistics should take this distinction into consideration. But this distinction has not been recognized as having any significance in connection with treatment. Only in the preliminary report² published by one of us in 1909, and in a paper by Porter³ which has since appeared, has there been any account taken of these two stages in compiling the statistics.

Throughout this report the two stages are considered separately, and for brevity will be spoken of as first and second stages respectively. Since some cases develop from the first to the second stage in the ward they have entered twice into the tables given below. Among those from the Cook County Hospital there were 430 of the first stage that never became delirious and 272 that did, making the total number of first stage cases 702. On the other hand, there were 233 cases admitted to the hospital in the second stage, and these with the 272 that became delirious in the wards make a total of 505 for the second stage. Thus, due to the fact that 272 cases are each represented twice in the tables, there appear to be a total of 1206 instead of 934 for both stages.

COMPLICATIONS. In the series of five hundred cases, previously reported, very few with serious complications were included, for in collecting these histories only the files on alcoholism were consulted. Of fractures there were 13 and of pneumonia 14 instances. In the second series the files on fractures were also examined, and 61 with delirium tremens were secured. The extent to which other complications entered into this second series is indicated in Table I. Altogether there were 88 complicated cases and they have been entered separately in the tables given below.

TABLE I.—Complications in the Second Series.

Fractures	61
Pneumonia	8
Nephritis	5
Pulmonary edema	1
Infection of hand	1
Burn of hand	1
Ulcers	8
Contusion of hip	1
Psoriasis	1
Dislocation of clavicle	1

² Jour. Amer. Med. Assoc., 1909, p. 1224. ³ Die Therapie der Gegenwart, 1910, p. 270

MORTALITY. We have given in Table II a tabulation of the mortality in delirium tremens as reported by various writers. The hospitals in which the cases were treated and the number of cases on which the percentages were based are given wherever these facts could be readily obtained. It will be seen that the mortality has varied greatly, Boston reporting a mortality of 37 per cent. and Moller 2 per cent. Now it is obvious to any one who reads these reports that this difference is not due entirely or even for the greater part to the treatment used. A much more important factor is found in the variation of the type of cases received at the various hospitals. Such a variation might be due to a difference in the alcoholic drinks taken in different countries. One cannot read the German and Scandinavian accounts without being impressed with the fact that their cases are much more responsive to treatment than are those in our own hospitals. It is also probable that in different hospitals there is a wide difference as to the line drawn between chronic alcoholism and incipient delirium tremens. Furthermore, in some hospitals much more adequate nursing can be given than in others. Porter has recently called attention to this fact, stating that from a comparison of the mortality in different clinics it was not possible to draw any conclusion as to the value of the varying methods of treating these patients, for the reasons which we have already stated. But, he adds, where the same criteria can be applied to a homogeneous group of cases treated in a single hospital, valid conclusions may be drawn as to the efficacy of different methods of treatment employed. So far as we know, statistics of this sort have been published only by Ganzer, Porter, and ourselves.

TABLE II.—Mortality in Delirium Tremens.

		Per cent.
Moller ⁴	100	2
Krukenberg ⁵	161	16
Franke (after Krukenberg)	2117	387
Nacke (after Krukenberg)	..	..
Weiss (after Krukenberg)	..	..
Eichelberg ⁶	1574	..
Boston ⁷	140	52
Ganser ⁸	1051	36
Kraepelin (after Eichelberg)	..	..
Jacobsen (after Eichelberg)	..	..
Krafft-Ebing (after Eichelberg)	..	..
Bonhöffer (after Eichelberg)	..	..
Calmeil (after Eichelberg)	..	..
E. von der Porter ⁹	660	45

⁴ Frederiksberg Hospital, Copenhagen.⁵ Allg. Krankenhaus, Hamburg Eppendorf.⁶ Ibid.⁷ Philadelphia Hospital (Blockley).⁸ Städtischen Heil und Pflegeanstalt zu Dresden.⁹ Allg. Krankenhaus, St. George, Hamburg.

TABLE III.—Mortality in Delirium Tremens.

COOK COUNTY HOSPITAL			
Group	Cases	Died	Mortality Per cent.
All cases, 1905 to 1910	934	206	22.0
All cases, 1905 to 1908	500	132	26.4
All cases, 1908 to 1910	434	74	17.0
All first stage cases	702	8	1.1
All second stage cases	505	198	39.2
Uncomplicated second stage cases, 1908 to 1910	147	40	27.2
Complicated second stage cases, 1908 to 1910	57	26	45.6

MASSACHUSETTS GENERAL HOSPITAL			
Entire series	172	102	59.3
Uncomplicated	60	21	35.0
Complicated	112	81	72.3

Among the Cook County Hospital cases 206 out of 934 died, or 22 per cent., and of these, 198 were among the delirious patients, only 8 out of the 702 incipient cases terminating fatally, and in these 8 the lethal termination was obviously due to associated conditions, especially in the heart and lungs. Also note that during the first two and one-half years the mortality was 26.4 per cent., dropping to 17 per cent. during the second two and one-half years. Reasons for this decrease will be given later.

The mortality of 22 per cent. for the entire series (Cook County Hospital) corresponds with that reported by Franque, Nücke, Kraepelin, Jacobsen, and Krafft-Ebing, but is considerably higher than that given by other writers. It must be borne in mind, however, that these are American patients and there is some evidence to show that the mortality from delirium tremens is higher here than in Europe. The series of cases reported by Boston from the Philadelphia Hospital gave a mortality of 37 per cent. and the mortality in the Massachusetts General Hospital is even higher.

The mortality in the Massachusetts General Hospital, however, requires a word of explanation. It was obvious on examining these histories that the diagnosis of delirium tremens had been restricted to second stage cases, only a very few incipient cases having been diagnosticated and classified under that head. A very large percentage of the cases were complicated and this fact also increases the mortality. In order to compare the mortality in the two hospitals, the second stage cases in the Cook County Hospital from 1908 to 1910 have been divided into a complicated and uncomplicated group, and the death-rate computed separately. When these are compared with the complicated and uncomplicated cases in the Massachusetts General Hospital it is seen that the mortality in the latter is somewhat higher. These facts emphasize the statement already made that it is unsafe to compare the gross mortality from delirium tremens in two hospitals, and from the comparison draw conclusions concerning the treatment of delirium tremens.

TREATMENT. In this paper we will limit ourselves to a discussion of the results obtained by the administration of drugs; but in order to render possible the comparison of our results with those of others it is necessary to give in brief the usual method of nursing employed in delirium tremens in the Cook County Hospital. The patients are usually allowed to walk about the ward in the incipient stage unless confined to bed by some other malady. They are put in bed as soon as they become delirious and are retained there by mechanical means. Elimination is maintained by the administration of a cathartic on entrance and a free use of water and liquid foods. Hot baths and packs are seldom given. Variations from this manner of handling the cases are not taken into account because they will average themselves out in a long series.

Usually more than one drug is used in an individual case, and it has not been possible to compare a series of cases in which one was used alone with another series in which a different one was used by itself. In order to determine the value of any drug the cases were divided into two groups according to whether or not it was employed. All other factors will be the same in the two groups. For example, some patients receiving veronal will also be given whisky and others will not; and of those not receiving veronal whisky will be given to some and not to others. Such additional drugs will thus act as any other variables and average themselves out of the result in a long series. This would not be the case if any two drugs were habitually used in combination—but the only approach to this is the somewhat common combination of whisky and ergot. In order to determine how commonly such a combination occurred, all of the complicated cases in the second series were examined and it was found that there were 20 on ergot, 11 on ergot and whisky, and 12 on whisky, which shows that even these drugs were more commonly used separately than together.

Hypnotics. There is no uniformity of opinion as to whether hypnotics have any influence in cutting short an attack of delirium tremens. The enormous doses usually employed are often without effect, or if a short sleep is produced the patient awakens from it with unabated delirium. When the disease has run its course the patient falls into a profound sleep from which he awakens more or less himself. That this critical sleep can be induced by hypnotics is very doubtful and those usually used have proved so dangerous that in many quarters the use of all these drugs has been entirely eliminated. Rolleston,¹⁰ Eichelberg,¹¹ Ganser,¹² Kerr,¹³ Légrain,¹⁴

¹⁰ System of Medicine (Allbutt and Rolleston).

¹¹ München. med. Wochenschr., 1907, p. 978.

¹² Ibid., p. 120.

¹³ Twentieth Century Practice (Stedman), 1895, vol. iii.

¹⁴ Presse Méd. Par. 1907, p. 790.

Bonhöffer,¹⁵ Kraepelin,¹⁶ and Petty¹⁷ either do not use them at all, or else employ them late in the course of the disease and in a very small quantity. Aufrecht¹⁸ and Harnack¹⁹ on the other hand recommend the use of large doses of sedatives, especially chloral, maintaining that the treatment is efficacious and free from danger. Others take an intermediate position.

It is noteworthy that these two authors have laid stress on the value of hypnotics in putting delirious patients to sleep, paying little or no attention to its efficacy in preventing the first stage of the disease being transformed into the second. Now, as will be shown later, it is on the incipient cases that these drugs act most effectively. To illustrate, the effect of the drugs on the two classes of cases we have divided the 934 cases into two groups, representing the first and second stages of the disease. It also seemed desirable to maintain separately the first series of 500 and the second series of 434, and to redivide this second group into complicated and uncomplicated cases. This will give the reader a chance to determine the distribution of the cases and the effect of any drug on any particular group.

TABLE IV.—Use of Chloral in the First Stage.

		Chloral used		Chloral not used	
		Total	Dev.	Total	Dev.
First series		85	18	260	127
Second series	{ Uncomplicated	24	8	260	70
	{ Complicated	3	2	70	47
		112	28	590	244
Percentage becoming delirious		25%		41.3%	

TABLE V.—Use of Chloral in the Second Stage.

		Chloral used.		Chloral not used.	
		Total.	Died.	Total.	Died.
First series		145	65	156	67
Second series	{ Uncomplicated	31	5	116	35
	{ Complicated	7	5	50	21
		183	75	322	123
Mortality		40.9%		38.2%	

Chloral is one of the most commonly used of these drugs and is given the preference by Aufrecht, Harnack, and Krukenberg,²⁰ while it is considered extremely dangerous by Eichelberg, Ganser, and Legrain. It was used somewhat less extensively than the bromides in the Cook County Hospital. The dose varied from 10 to 30 grams often repeated every four hours and frequently combined with some other sedative as bromide or morphine. It will

¹⁵ Cited by Møller.¹⁶ Cited by Møller.¹⁷ Alabama Med. Jour., 1909, p. 779.¹⁸ München, med. Wochensh., 1907, p. 1589.¹⁹ Handbuch der Praktischen Medizin (Erlstein und Schwallbe), 1906, vol. iv.²⁰ Zeitschrift f. klinische Medizin, vol. xix, sup. Hefte, p. 1.

be clear from a glance at the tables that it acts very differently in the first and second stages of the disease. While our data do not permit us to draw any conclusion as to its ability to induce the critical sleep, yet it is obvious that on the whole its effect on the delirious patients was unfavorable, the mortality in the 183 cases in which it was used being 2.7 per cent. higher than in the 322 cases in which it was not used. Its effect on the circulation more than counterbalanced any good it did. Quite a different result is noticed in incipient delirium tremens. Of the 112 such patients treated with chloral, only 25 per cent. became delirious, while of the 590 not so treated, 41.3 per cent. did develop delirium. It therefore possesses a marked influence in preventing the disease from passing from the first into the second stage.

TABLE VI.—Use of Bromides in First Stage.

		Bromides used.		Bromides not used.	
		Total.	Dev.	Total.	Dev.
First series		189	62	157	83
Second series	Uncomplicated	115	18	169	60
	Complicated	17	7	55	42
		321	87	381	185
Percentage developing delirium		27.1%		48.6%	

TABLE VII.—Use of Bromides in the Second Stage.

		Bromides used.		Bromides not used.	
		Total.	Died.	Total.	Died.
First series		198	90	103	42
Second series	Uncomplicated	68	19	79	21
	Complicated	24	10	33	16
		290	119	215	79
Mortality		41.0%		36.7%	

Bromides have been less discussed than chloral, being apparently considered both less dangerous and less effective. In the Cook County Hospital they were very extensively used in doses of 30 to 90 grains, repeated every four hours. The results given by the bromides were not very different from those obtained by the use of chloral. The delirious patients were certainly not benefited by their use, there being a mortality of 41 per cent. when they were used as against 36.7 per cent. when they were not used. Of the incipient cases, however, that received them, only 27.1 per cent. became delirious as against 48.6 per cent. among those that did not receive them.

TABLE VIII.—Use of Paraldehyde in the First Stage.

		Paraldehyde used.		Paraldehyde not used.	
		Total.	Dev.	Total.	Dev.
First series		..	..	..	..
Second series	Uncomplicated	28	5	256	73
	Complicated	4	1	69	48
		32	6	325	121
Percentage becoming delirious		18.8%		37.3%	

TABLE IX.—Use of Paraldehyde in the Second Stage.

		Paraldehyde used.		Paraldehyde not used.	
		Total.	Died.	Total.	Died.
First series		..	..	..	..
Second series	Uncomplicated	20	8	127	32
	Complicated	2	0	55	26
		22	8	182	58
Mortality		36.4%		31.8%	

Paraldehyde has not been extensively used and practically nothing is said concerning it in the literature on this subject. In the first series only a few cases were treated with it, but in the second there were a sufficient number to justify their tabulation. Its action seems to be very similar to that of chloral and the bromides, slightly increasing the mortality in the delirious patients and very considerably lessening the danger of an incipient case becoming delirious.

TABLE X.—Use of Morphine in the First Stage.

		Morphine used.		Morphine not used.	
		Total.	Dev.	Total.	Dev.
First series		70	27	275	118
Second series	Uncomplicated	82	25	202	53
	Complicated	12	7	61	42
		164	59	538	213
Percentage becoming delirious		35.9%		39.6%	

TABLE XI.—Use of Morphine in the Second Stage.

		Morphine used.		Morphine not used.	
		Total.	Died.	Total.	Died.
First series		150	64	151	68
Second series	Uncomplicated	84	33	63	7
	Complicated	37	18	20	8
		271	115	234	83
Mortality		42.4%		35.4%	

Morphine and opium were once very extensively used and Rolleston and Harnack still recommend them. They are, however, both useless and dangerous. We do not intend to go into the theoretical reasons against the use of morphine, believing that it is sufficiently condemned by its own results as given in the table. In the delirious patients it increased the mortality more than chloral, paraldehyde, or the bromides, and in the incipient cases it had little if any effect in warding off the stage of delirium. The dose of morphine was usually one-quarter of a grain, repeated at intervals of four hours.

TABLE XII.—Use of Hyoscine in the First Stage.

		Hyoscine used.		Hyoscine not used.	
		Total.	Dev.	Total.	Dev.
First series		39	15	306	130
Second series	Uncomplicated	21	3	263	75
	Complicated	2	2	71	47
		62	20	640	252
Percentage becoming delirious		32.2%		39.3%	

TABLE XIII.—Use of Hyoscine in the Second Stage.

		Hyoscine used.		Hyoscine not used.	
		Total.	Died.	Total.	Died.
First series		110	56	191	76
Second series	Uncomplicated	31	14	116	26
	Complicated	9	6	48	20
		150	76	355	122
Mortality		50.7%		34.3%	

Hyoscine. Legrain, who seldom uses a hypnotic in these cases, states that whenever one is imperatively demanded he prefers hyoscine to any of the others. But the drug has not been generally recommended. When given to these patients in the Cook County Hospital (dose $\frac{1}{100}$ to $\frac{1}{50}$ gr.) it proved itself to be very dangerous, the mortality in the delirious patients being increased by its use 16.4 per cent. It is of less service than chloral, paraldehyde, or the bromides in preventing the transformation of the first into the second stage.

We feel justified from these results in saying that neither morphine nor hyoscine should be used in the treatment of delirium tremens, but of the two hyoscine is undoubtedly the worse.

TABLE XIV.—Use of Veronal in the First Stage.

		Veronal used.		Veronal not used.	
		Total.	Dev.	Total.	Dev.
First series		85	9	199	69
Second series	Uncomplicated	5	4	67	45
	Complicated	6	4	67	45
		91	13	266	114
Percentage becoming delirious		14.3%		42.8%	

TABLE XV.—Use of Veronal in the Second Stage.

		Veronal used.		Veronal not used.	
		Total.	Died.	Total.	Died.
First series		50	8	97	32
Second series	Uncomplicated	16	6	41	20
	Complicated	16	6	41	20
		66	14	138	52
Mortality		21.2%		37.6%	

It will be noticed that the drugs so far mentioned have increased the mortality when given to delirious patients. The only hypnotic that did not have this effect was veronal. This drug was used but seldom in the first series and has therefore been tabulated only in the second. Of the 66 cases in the second stage receiving veronal, 14 died, or 21.2 per cent., while of the 138 not receiving it 52 died, or 37.6 per cent., making a decrease in the mortality of 16.4 per cent. It was also superior to the other hypnotics in its action on the incipient cases. Of 91 such treated with veronal 13 became delirious,

or 14.3 per cent., while of the 266 not so treated 114 became delirious, representing a decrease due to veronal of 28.5 per cent.

From our personal experience with these cases we can say that the superiority of veronal over the other hypnotics is quite as easily recognized at the bedside as from tabulations such as these. It is possible to produce a pronounced sedative effect on the nervous system without any disturbance of the circulation (Köhler), and all recorded cases of veronal poisoning are said by Porter to have shown that it does not depress the circulation. If the statements by Köhler and Porter are correct it is easy to understand why veronal is superior to the other hypnotics in the treatment of a disease where the heart is so often in a weakened condition.

Similar results have been obtained by others. Porter reports a series of 660 cases treated at the Allgemeine Krankenhaus, St. George, Hamburg, from 1901 to 1909. From 1901 to 1906, during which time there were 396 cases, chloral and bromides were used with 36 deaths, or 9 per cent. From 1906 to 1909 there were 264 cases almost exclusively treated with veronal with 9 deaths, or 3.4 per cent. At the same time the number of cases developing from the first to the second stage in the hospital was reduced from 18 per cent. to 5.6 per cent.

Møller²¹ also reports that until 1903 they had used an expectant plan of treatment for these cases in the Fredericksburg Hospital, Copenhagen, having previously found all hypnotics useless. Since 1903 they have used veronal with excellent results. But he does not compare the mortality before and after the use of veronal as begun. Friedreich²² has also reported on the use of veronal in delirium tremens, but his paper is not accessible.

It is clear that the hypnotics as a class act much more favorably on the incipient than on the fully developed cases, each having reduced the number passing from the first into the second stage. But morphine and hyoscine are much less effectual in this regard than the others. Since in some cases more than one hypnotic was used, the results cannot be taken as absolute. A drug like morphine, since it was sometimes used with chloral, may owe its apparent slight value to such an occasional combination with a more effective drug. To what extent such combinations occurred can be judged from Tables XVI and XVII.

TABLE XVI.—The Effect of Hypnotic Drugs in General on Incipient Delirium Tremens.

	Total.	Dev.	Per cent.
On any hypnotic	538	167	31.0
On no hypnotic	165	107	64.8

²¹ Berl. klin. Wochensh., 1909, p. 2340.

²² Ugeskrift for Læger, December, 1909.

TABLE XVII.—The Effect of Individual Hypnotic Drugs on Incipient Delirium Tremens.

	Total.	Dev.	Per cent.
On morphine	164	59	35.9
On hyosine	62	20	32.2
On bromide	321	87	27.1
On chloral	112	28	25.0
On paraldehyde	32	6	18.8
On veronal	91	13	14.3

Table XVI shows that it is possible in the majority of incipient cases to arrest the course of the disease by the use of hypnotics. Of the cases to which such drugs were administered only 31 per cent. became delirious as against 64.8 per cent. of those not so treated. This emphasizes the fact that it is of the utmost importance that the responsiveness of the incipient cases to treatment should be recognized, and the patient given the benefit of treatment at the onset of the first symptoms.

Table XVII presents the hypnotics arranged in order from the least to the most efficient. It will be seen that the sum of the numbers representing the totals in Table XVII is 782 or 244 more than the number of cases (538) that were given hypnotics. Hence almost one-half of the cases received two or more such drugs in combination. Of course a drug like morphine which has little if any value would profit in these statistics by an occasional combination with a more efficient drug, and, while the relative positions of the drugs in Table XVII are correct, there is actually more difference in their value than is there represented.

Alcohol. The use of alcohol is almost universally condemned at the present time. Lambert,²³ Aufrecht, Eichelberg, Kraepelin, Bonhoffer, Porter, Harnack, Kerr, and Legrain, who speak from experience in large hospitals in England, Germany, France, and America, say that it should be used if at all only in the cases complicated with some serious condition like pneumonia. Edwards²⁴ advises the continuation of alcohol in moderate doses.

So far as we have been able to ascertain the objections to alcohol by the above named authors are upon theoretical grounds. They say that, since it has been shown that the withdrawal of alcohol cannot of itself precipitate an attack of delirium tremens in a chronic alcoholic, it is not necessary that it should be given to patients presenting symptoms of incipient delirium tremens. And since delirium tremens is obviously a toxemia based upon chronic alcoholism, the alcohol should at once be withdrawn to lessen such toxemia. We have not encountered in the literature any evidence to show that the withdrawal of alcohol decreases the mortality from delirium tremens or decreases the number of cases developing

²³ System of Medicine (Osler).²⁴ Practice of Medicine.

delirium. In the absence of such evidence we feel that facts to be presented should outweigh theoretical considerations.

TABLE XVIII.—Use of Alcohol in the First Stage.

	Alcohol used.		Alcohol not used.	
	Total.	Dev.	Total.	Dev.
First series	110	31	235	114
Second series { Uncomplicated	80	14	204	61
	12	4	61	45
	202	49	500	223
Percentage becoming delirious	24.3%		44.6%	

TABLE XIX.—Use of Alcohol in the Second Stage.

	Alcohol used.		Alcohol not used.	
	Total.	Died.	Total.	Died.
First series	131	59	170	73
Second series { Uncomplicated	69	16	78	24
	17	8	40	18
	217	83	288	115
Mortality	38.2%		39.9%	

Of 217 delirious patients who received alcohol (practically always in the form of whisky in ounce doses four to six times daily) 83 died or 38.2 per cent., while of 288 such patients not so treated 115 died or 39.9 per cent. The mortality was thus 1.7 per cent. less when alcohol was given. While this decrease in the mortality is not large, we believe that these results render the question whether alcohol should be given to delirious patients one which is most decidedly open to discussion, and not as most writers would have us believe, settled against the use of alcohol.

It should, however, never be withdrawn from cases of incipient delirium tremens. Of 202 such cases on alcohol, 49, or 24.3 per cent. became delirious, while of 500 similar cases deprived of alcohol, 44.6 per cent. became delirious, or 20.3 per cent. more. This clearly shows that while the withdrawal of alcohol may not of itself be sufficient to bring on an attack of delirium tremens in a chronic alcoholic, yet when from other causes the patient is already in the incipient stage, the withdrawal of alcohol greatly increases the chances that he will become delirious.

Ergot. For a number of years Livingston and Lambert have been advocating the use of ergot in chronic alcoholism and Lambert has pointed out the fact that ergot is of great value in the treatment of delirium tremens. Lambert uses ergot hypodermically in Livingston's solution. (One dram solid extract of ergot, one ounce of sterile water, three drops of chloroform, and three grains of chloretone. Filter. Dose, 30 drops into the muscles every two to four hours.) He says that "after it there is a distinct tendency to a quieter delirium and less need of restraint, it reduces the tremor, less hypnotic is required and it diminishes the tendency to wet

brain." Since he began the use of ergot in the Bellevue Hospital there has been a marked decrease in the death rate from delirium tremens on his service.

TABLE XX.—Use of Ergot in the First Stage.

		Ergot used.		Ergot not used.	
		Total.	Dev.	Total.	Dev.
First series		72	17	273	128
Second series	Uncomplicated	123	19	161	59
	Complicated	13	4	60	45
		208	40	494	232
Percentage becoming delirious		19.2%		46.9%	

TABLE XXI.—Use of Ergot in the Second Stage.

		Ergot used.		Ergot not used.	
		Total.	Died.	Total.	Died.
First series		80	23	221	109
Second series	Uncomplicated	65	13	82	27
	Complicated	22	12	35	14
		167	48	338	150
Mortality		28.7%		44.3%	

The results in our series fully confirm all that Lambert has said. Of 167 delirious patients on ergot 48, or 28.7 per cent. died, while of 338 similar cases not on ergot 150 died, or 44.3 per cent. It thus appears that the use of ergot decreased the mortality 15.6 per cent. It is equally beneficial in the incipient cases, since only 19.2 per cent. of the cases receiving it developed delirium as compared with 46.9 per cent. among those not getting it.

These results have been obtained by the administration of ergot by mouth, the usual dose being one dram of the fluid extract repeated every four hours. It is evident, therefore, that when it is administered in frequently repeated doses by mouth enough is absorbed to produce definite results. These conclusions are not opposed to the results of the experiments carried out by Croyn and Henderson,²⁵ from which they conclude that pharmacological doses of ergot are ridiculously low, that at least an ounce of any fluid extract should be given by mouth, and that in any case intramuscular injection is to be preferred. They were looking for a sudden and marked effect upon the blood pressure in normal animals, while in delirium tremens the object is to secure a prolonged action upon a disordered circulation, especially the constriction of the dilated arterioles of the brain. Moreover, according to Wood and Hofer,²⁶ the majority of specimens of fluid extract of ergot (6 out of 7) obtained directly from the manufacturer reached a reasonable standard of activity, but deteriorated rapidly especially when kept in unsealed bottles.

²⁵Jour. of Pharm. and Exp. Therapeutics, August, 1909.

²⁶Arch. of Int. Med., 1910, vi, p. 388.

They conclude that deterioration from age is the chief reason for the unsatisfactory results obtained with the ordinary retail specimens. It is probable that in a hospital where large amounts of ergot are used daily, the drug is reasonably fresh and active. The results of Wood and Hofer also show that the doses recommended by Croyn and Henderson are excessive. No cases of ergotism have come to our attention from this treatment, and Lambert has not observed any at the Bellevue Hospital.

In delirium tremens there is an active hyperemia of the brain and in many cases œdema also. It is reasonable to suppose, and this supposition has been tacitly made in the preceding paragraph, that ergot, which is said to have a selective action on dilated blood-vessels, should produce its effect in delirium tremens by reducing the cerebral hyperemia. It should be remembered, however, that it is not without influence on the general circulation and may be valuable as a stimulant. This last supposition receives some support from the facts mentioned in the next paragraph.

Stimulants were used very rarely and only in moribund cases, so that any consideration of their value is out of the question. Ganser has called attention to the marked decrease in his death rate from delirium tremens when he began to pay more attention to the circulation; and it seems clear to one examining the records here reported that too little attention was given to this phase of the treatment.

TREATMENT IN THE MASSACHUSETTS GENERAL HOSPITAL. There are certain points which should be mentioned in connection with the cases treated at the Massachusetts General Hospital. These cases quite generally received large doses of hypnotics, hyoscine and morphine being given much more frequently than at the Cook County Hospital. No ergot was used and practically no veronal. In 55 cases in which note was made of the treatment, 35 received morphine, 32 hyoscine, and 5 veronal. As we have already stated, it is not safe to draw conclusions concerning treatment from the mortality in delirium tremens in widely separated hospitals. But it is at least suggestive that the mortality (Table III) was higher at a hospital where the two drugs that gave the worst results at the Cook County Hospital were extensively used and where the two drugs that gave the best results were not employed. In this connection it should be pointed out that in the first series of Cook County Hospital cases (1905 to 1908), where little ergot and practically no veronal were used the mortality (Table III) was 26.4 per cent.; while in the second series (1908 to 1910), where both ergot and veronal were extensively employed, the mortality was 17.5 per cent.

SUMMARY. In conclusion it may be said that medicinal treatment of delirium tremens is much more effective in the first than in the second stage of the disease. Our results would indicate that incip-

ient cases should receive large doses of the hypnotics of which veronal is by far the best, whisky should be given regularly, and ergot administered at frequent intervals either by intramuscular injection or by mouth. Such medication should be discontinued gradually and only after all signs of restlessness and tremor have disappeared. The delirious patient should receive veronal in moderate doses—all other hypnotics and especially morphine and hyoscine should be withheld. Ergot should be given as in the incipient cases. So far as the delirious patients are concerned, our data do not give conclusive evidence whether or not whisky should be regularly employed.

THE CAUSE AND RELIEF OF PAIN IN DUODENAL ULCER.¹

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THE first mention in medical literature of duodenal ulcer is the report of two cases determined post mortem by Mr. Travers² in 1817. The second record is that by an American physician, Irvine, of Philadelphia; but it is to John Abercrombie,³ a Scotch physician, that we must ascribe the priority of noticing the phenomenon that in disease of the duodenum food is taken with relish; that the first stage of indigestion is not interfered with, and that the pain begins about the time the food is leaving the stomach, namely, two to four hours after meals. This was in 1830.

It was not until 1887 that this symptom complex was reëstablished by Buequoy,⁴ who made the first symptomatic diagnosis which was confirmed at autopsy; the intervening fifty-seven years, containing only records of 143 cases collected from the pathologists and general hospital services where death had ensued from perforation, although in 1852, Wunderlich⁵ mentions a case of death from perforation, in which it is stated that ulcer of the duodenum was suspected previously.

Codivilla,⁶ an Italian surgeon, was the inaugurator of operative interference in cases of chronic non-perforated ulcer of the duodenum, when he demonstrated the efficacy of a gastro-enterostomy in this condition on March 22, 1893, and again on May 5, 1898.

¹ Read before the American Gastro-Enterological Association, April, 1911.

² *Medico-Chir. Trans.*, London, viii, 232.

³ *Path. and Pract. Research of Dis. of the Stomach.*, Edinburgh, 1830, pp. 103, etc.

⁴ *Arch. gén. de méd.*, 1 to 398 et seq.

⁵ *Handbuch der Path. und Therap.*, 111 to 175.

⁶ *Sci. Casi Gastroenterost. Sperimentale. Mem. Orig.*, Firenze, 1893, pp. 406 to 421, and *Contrib. alla chirug. gastrica.*, Bologna, 1898.